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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NATIONAL RISK MANAGEMENT RESEARCH LABORATORY
SUBSURFACE PROTECTION AND REMEDIATION DIVISION
P.O. BOX 1198 • ADA, OK 74820

April 18, 2003

OFFICE OF
RESEARCH AND DEVELOPMENT

MEMORANDUM

SUBJECT: Sauget Area 1 Superfund Site, Sauget, IL (02-R05-001)
Workplan for DNAPL Characterization and Remediation Study

FROM: Steven D. Acree, Hydrogeologist
Applied Research and Technical Support Branch

TO: Nabil Fayoumi, RPM
U.S. EPA, Region 5

As requested, the referenced document has been reviewed under the direction of James W. Mercer, Ph.D., P.G., of Geotrans Inc., through Dynamac Corporation. Dynamac Corporation is an off-site contractor providing technical support services to this laboratory. In general, the workplan is responsive to the request for additional characterization of DNAPL and the potential types of remedial options that may be appropriate at Area 1. The following comments and recommendations are intended to enhance the investigation.

General Comments

1. Based on the DNAPL thickness data provided in Table 4-0c and locations of monitoring wells/piezometers in Figure 4-37 of the EE/CA for Area 1, DNAPL is found beyond Sites G, H, and I, including as far south as P3-A-S and P3-B-S. For this reason, it is not clear why only Sites G, H, and I are considered for the DNAPL study. In order to determine the extent of DNAPL, the study needs to extend beyond these three Sites. It would be helpful to provide a plot of the DNAPL thickness data in Table 4-0c showing the various Sites and all monitoring wells/piezometers. This figure could be used to show the proposed locations of soil borings/monitoring wells.

2. Existing soil boring data should be used to construct structural maps on low-permeability layers and an alluvial aquifer/bedrock contact map showing the top of bedrock topography. Depending on the level of detail and confidence in these maps, it may be necessary for the Workplan to consider the use of surface geophysics (e.g., seismic reflection) to more accurately map units, especially the top of bedrock topography. This can be used to help identify stratigraphic traps for potential monitoring well locations.

Specific Comments

Task 2

3. The proposed survey for DNAPL in approximately 35 existing monitoring wells in Task 2 should be expanded to include all piezometers and wells in the potential DNAPL area. The survey should include monitoring at perimeter wells where DNAPL is not present to help bound the separate phase contamination. Monitoring at perimeter wells (where NAPL is not expected) should precede work in the 'dirty' area, with care taken to prevent cross-contamination. The results of the survey can then be compared to the results shown in Table 4-0c, which shows 33 monitoring wells/piezometers containing DNAPL (with a maximum DNAPL thickness of 23.29 feet at EE-01 within Site H). In addition, methods proposed for fluid thickness and interface measurement (interface probe, cotton string, and bailer) are appropriate, but protocols should be developed for cleaning the interface probe and possibly restricting the use of a 'clean' interface probe to 'clean' wells and a 'dirty' interface probe to 'dirty' wells.

4. Samples of NAPL retrieved using a bailer from each well during Task 2 should be tested, at a minimum, for viscosity and density (at known temperature). Simple methods (e.g., viscosity cup or viscometer for viscosity and hydrometer for density) are available to make these measurements. Qualitative observations of NAPL wettability (e.g., by checking spreading of NAPL injected using a pipette on alluvium, bedrock, and glass in a water-filled glass beaker) can also be made and documented by taking photographs and notes. Making measurements of NAPL properties at many locations will provide insight to the distribution of immiscible fluid at the site.

Task 3

5. The plan proposes to install only three new boring/piezometers. Based on the table of wells/piezometers containing DNAPL, DNAPL appeared to be more wide spread than indicated by this proposal. Plots of DNAPL and top of bedrock are needed to see where new wells should be placed. These plots will help determine in which directions we know the extent of DNAPL and those directions where we do not know the extent. Using this lack of DNAPL definition as well as knowledge of the top of bedrock (indicating potential DNAPL flow directions), new wells can then be located and drilled. Using this knowledge regarding the lack of DNAPL definition in specific areas as well as knowledge of the top of bedrock (indicating potential DNAPL flow directions), new wells can then be located and drilled. The number of wells depends on what these maps show. It is recommended that this information be provided to support the decision concerning the appropriate number of borings/piezometers.

6. Soil sample collection should be performed using methanol as a preservative (i.e., EPA SW846 Method 5035).

7. Depending on integrity of the bedrock (fractures, etc.) and whether the bedrock contains DNAPL, it may be necessary to perform further characterization of the bedrock. The EE/CA,

RI/FS report indicates that DNAPL has accumulated at the alluvium/bedrock interface. The carbonate bedrock is assumed to be fractured in a heterogeneous manner. It is considered highly likely that DNAPL and dissolved contaminants have migrated into the rock. It is suggested that the presence of DNAPL in bedrock below the alluvium/bedrock interface should be evaluated, in part, by examining contaminant concentrations in groundwater sampled at downgradient locations (thought to be beyond the DNAPL zone.) Some discussion/analysis should be presented to explain groundwater flow patterns and rates between the site and the Mississippi River, including flow between the alluvium and rock.

8. Consideration should be given to placing a hydrophobic dye-striped NAPL FLUTe strip between the Rotasonic soil core and the plastic core sleeve to help identify NAPL presence as described by Griffin and Watson (2002, Ground Water Monitoring & Remediation 22(2):48-59).

9. It is suggested that representative samples of core also be analyzed to determine formation porosity and fraction organic carbon rather than using assumed values in the proposed calculations. These data are relatively inexpensive to acquire and will better support calculations of DNAPL saturation using a program such as NAPLANAL (available at www.dnapl.com/publications.html).

Task 4

10. Given the thickness of DNAPL that accumulates in existing wells, it would appear that DNAPL recovery tests could also be performed on select existing wells. Consideration should be given to using alternative methods of pumping (e.g. inertial lift) in which only disposable components are placed downhole.

Task 5

11. It is recommended that measurements be made to determine the relationship between surfactant concentration and NAPL-water interfacial tension as part of the surfactant treatability test.

If you have any questions concerning this evaluation, please do not hesitate to call me at your convenience (580-436-8609). We look forward to future interactions with you concerning this and other sites.

cc: Rich Steimle (5102G)
Larry Zaragoza (5204G)
Luanne Vanderpool, Region 5
Doug Yeskis, Region 5